Integrated Science 3001G – *Materials and Biomaterials*
Course Information: Winter 2022

Note: This Course Information sheet will be updated as necessary. Please check the class OWL site for updates.

1. General Information

Welcome to IS3001G – the 4th of your WISc-specific courses.

Calendar Description: An examination of the properties and applications of materials that are important to modern society. This includes both natural materials and synthetics including alloys, polymer/nanoparticle composites and optical and electronic materials. Team-based projects will investigate a problem related to the development, manufacture or analysis of a new material or biomaterial.

Prerequisites: Enrolment in Year3 of the Western Integrated Science Program.

Antirequisites: Chemistry 3364A/B.

2 lecture hours, 2 tutorial hours, 0.5 course

Note: Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

Lectures:	Tuesdays	5:30 pm – 7:30 pm	PAB 150
Tutorials:	Thursdays	6:30 pm – 8:30 pm	NCB 293

Note: Some "tutorials" may be run as "lectures" … see the course OWL site for a schedule.

Contact Information:

Instructor: Prof. Jeff Hutter

email: jhutter@uwo.ca

office: NCB 240, PAB 209

office hours: by appointment (in person if possible, otherwise via Zoom)

The best way to reach me outside of class or my office hours is by email. Please use your **UWO email account** so that your message is not deleted as spam, make sure the subject line begins with "IS3001G," and allow 2–3 business days for a response.

If you need to meet with me at a time other than my scheduled office hours, please make an appointment by email to arrange a time.

Delivery mode:

This course will be delivered online at the specified lecture/tutorial times until at least at least January 27th. The intent is for the course to be in-person beginning February 1st, contingent on direction from the University and the London-Middlesex Health Unit. However, further periods of online instruction may be necessary.

During any periods of online instruction, assessments will be conducted online. Unless conducted in-person, quizzes, tests, and examinations may be conducted using a remote proctoring service.

2. Course Materials

Textbook: There is no formal textbook for this course. There are many good books on Materials Science in the Library. One good one is *Materials Science and Engineering* by W. Callister.

If you feel you would *like* to have a textbook, the textbook for Engineering Science 1021 – Ashby, *Materials Engineering Science Processing and Design* – available in the Bookstore is equivalent to Callister.

A less expensive option would be one-year access to the eBook *Science and Engineering of Materials* (Askeland and Wright), also available at the Bookstore.

OWL: http://owl.uwo.ca/

All course information, including

- general course information
- day-by-day lecture schedule (which will be updated frequently)
- class notes
- supplementary materials
- announcements
- your gradebook

will be hosted on OWL. Please contact your instructor if you do not have access to the IS 3001G site.

Computer: capable of running Zoom and (possibly) remote proctoring software, with a working webcam and microphone, and a stable internet connection will be needed.

Scientific calculator: may be useful for quizzes and tests. Only non-programmable, non-networked calculators are permissible.

3. Course Content

The course content is *roughly* outlined in the following table … see the OWL site for more detail.

Week	Topic
1	Introduction to materials
2	Bonding in materials
3	Crystal structures

4	Imperfections: defects, dislocations, and surfaces
5	Mechanical properties of materials
6	Thermodynamics
7	Phase diagrams
8	Nucleation and growth
9	Polymers
10	Metals, semiconductors, and conductivity
11	Semiconductor devices
12	Optical properties and devices

Learning outcomes

By the end of the course, students should be able to:

- Explain the types of bonding in materials and their relative strength.
- Identify crystal structures.
- Label crystal coordinates, directions, and planes.
- Identify imperfections in crystals, including point defects, dislocations, and interfaces.
- Understand the mechanical properties of materials and how they arise from bonding.
- Read a phase diagram and predict the equilibrium state of a system at a given temperature and composition.
- Understand the processes of nucleation and growth, and how they give rise to material morphology.
- Understand the basic properties of polymers and characterise their polydispersity.
- Understand a simple microscopic model of conductivity.
- Explain how basic semiconductor devices (e.g., diodes) work.

4. Evaluation

Your final grade in this course will be derived according to:

Quizzes	10%
Midterm Test (March 3 in NCB 293)	20%
Final Exam (TBD)	20%
Research Paper Review	15%
Research Paper Presentation	5%
Group Project	20%
Group Presentation	10%

Quizzes will be held in class approximately every other week beginning in week 3. There will be no "make-up" quizzes – if you are granted academic considerations for a quiz (either through a self-reported absence or for reasons approved by the Science Academic Counsellors), your quiz grade will be based on the remaining quizzes.

The **Midterm Test** will be held in class on March 3rd. You may bring a non-programmable, non-graphing, non-wi-fi-enabled calculator into the exam room. No other aids, including additional sheets, computers,

tablets, cellular phones, PDAs, advanced calculators, or other electronic devices are permitted.

The **Final Exam** will be non-cumulative and held on a date specified by the Office of the Registrar. As with the midterm, you may bring a non-programmable calculator to the quiz.

Details and suggestions for the **Research Paper Review** and **Presentation** will be posted by week 5. Students will select a paper from the recent primary literature, write a synopsis, and provide a *brief* presentation to the class. The written submission will be due on March 8 and presentations will be scheduled shortly thereafter.

Details for the **Group Project** will be posted by week 6. Students will be assigned to groups of 4–5 students and will research a topic in materials science with an interdisciplinary nature. A joint paper of at least 2500 words will be due by March 31st.

The **Group Presentations** will be held during the last week of classes. Each group will jointly present their projects in a conference-style talk of no more than 12 minutes, with 3 minutes for questions from the audience.

Note that to earn a passing grade in this course, a passing grade is needed on both the "examination" (quizzes, test, and final) and "project" (paper review, group project, and presentations) portion of the course.

5. Academic Consideration for Missed Work

Students who are seeking academic consideration for missed work during the semester may submit a self-reported absence form online provided that the absence is 48 hours or less and the other conditions specified in the Senate policy at

www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Consideration_for_absences.pdf

are met.

Students whose absences are expected to last longer than 48 hours, or where the other conditions detailed in the policy are not met (e.g., the student has already used 2 self-reported absences), may receive academic consideration by submitting a Student Medical Certificate (for illness) or other appropriate documentation (for compassionate grounds) to the Science Academic Counselling Office (via the Help Portal at https://www.uwo.ca/sci/counselling/). The Student Medical Certificate is available online at

www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf.

All students pursuing academic consideration, regardless of type, must contact their instructors no less than 24 hours following the end of the period of absence to clarify how they will be expected to fulfill the academic responsibilities missed during their absence. **Students are reminded that they should consider carefully the implications of postponing tests and exams or delaying submission of work, and are encouraged to make appropriate decisions based on their specific circumstances.**

Students who have conditions for which academic accommodation is appropriate, such as disabilities or ongoing or chronic health conditions, should work with Accessible Education Services to determine appropriate forms of accommodation.

Make-up and late policies specific to this course are as follows:

a) *Quizzes*: Students who have received academic considerations to miss a quiz, via either a self-reported absence or for reasons approved by their academic counsellors, will receive a quiz grade based on their remaining quizzes. There will be no make-ups for missed quizzes.

b) *Midterm Test:* There will be a single make-up, to be scheduled approximately one week after the

missed assessment.

c) *Projects:* Students are encouraged to work on their individual and group projects well in advance of the due dates. Late penalties of 10%/day will be applied. For an approved absence that affects submission of a paper, students may be granted an extension.

d) *Final Exam:* If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (the name given by the University to a makeup Final Exam).

   You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

Accommodations can be made for religious holidays. University policy on religious accommodations and a link to a calendar of dates is available at:

www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf.

6. Accessibility and Support

Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Accessible Education at 661-2111 x 82147 or aew@uwo.ca for any specific question regarding an accommodation.

Information on Western's policy on accommodation can be found at

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic%20Accommodation_disabilities.pdf.

Students who are in emotional/mental distress should refer to Mental Health@Western

https://www.uwo.ca/health/

for a complete list of options about how to obtain help.

For registrarial services (e.g., course enrolment, student finances, student records), please see

http://www.registrar.uwo.ca.

The University Students' Council (UCC) also offers a wide range of services. Please see

https://westernusc.ca/your-services/.

for details.

7. Academic Policies

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

Cheating includes having available in a test or exam any electronic devices other than those explicitly permitted. You may not have a cell phone accessible during quizzes or exams, even to use as a calculator or watch.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com

(http://www.turnitin.com).

Tests and examinations in this course may be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide **personal information** (including some biometric data) and the session will be **recorded**. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at:

https://remoteproctoring.uwo.ca.